# Municipal Wireless Broadband: Hype or Harbinger?

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**MIT Communications Futures Program**
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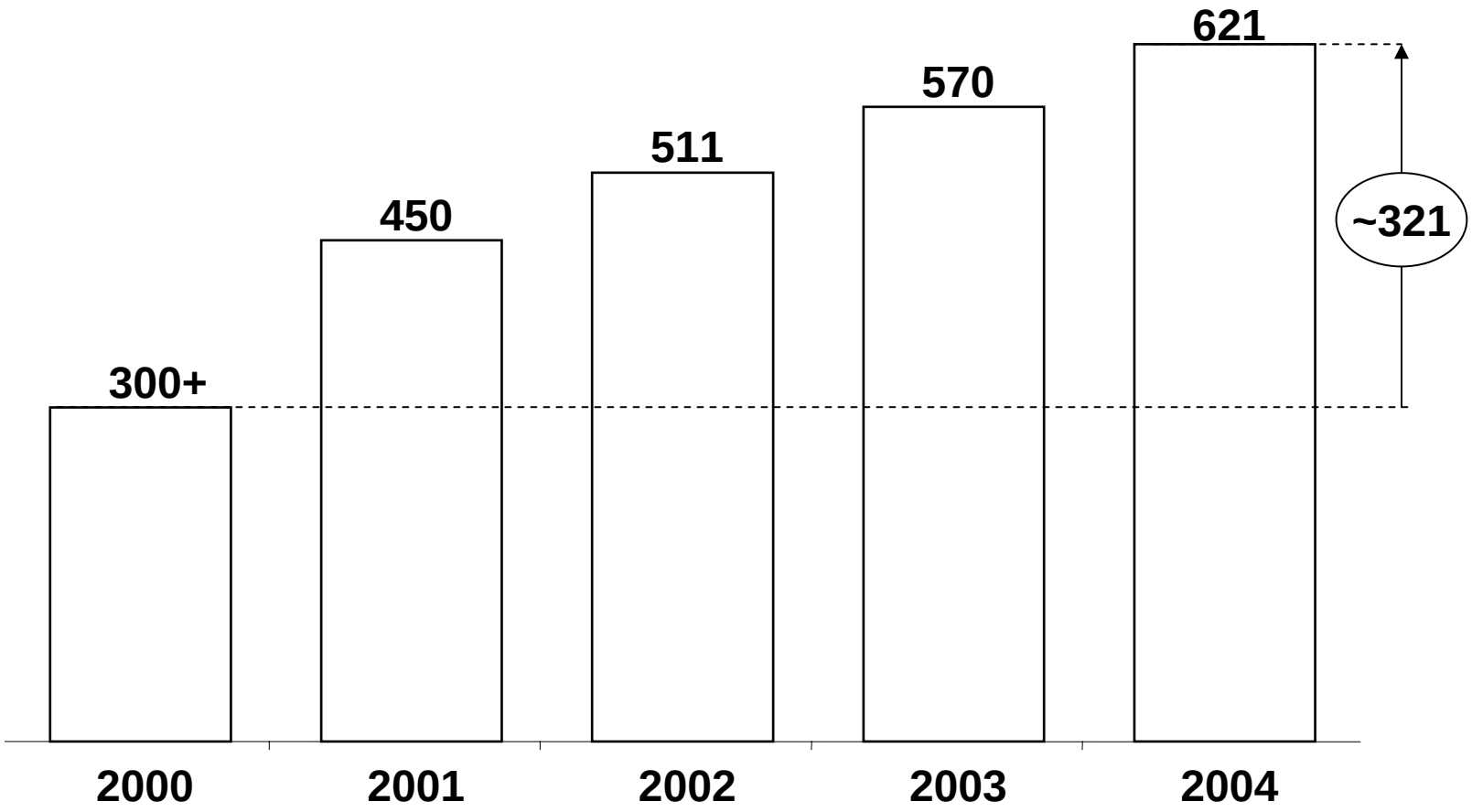
http://cfp.mit.edu

# Key Takeaways

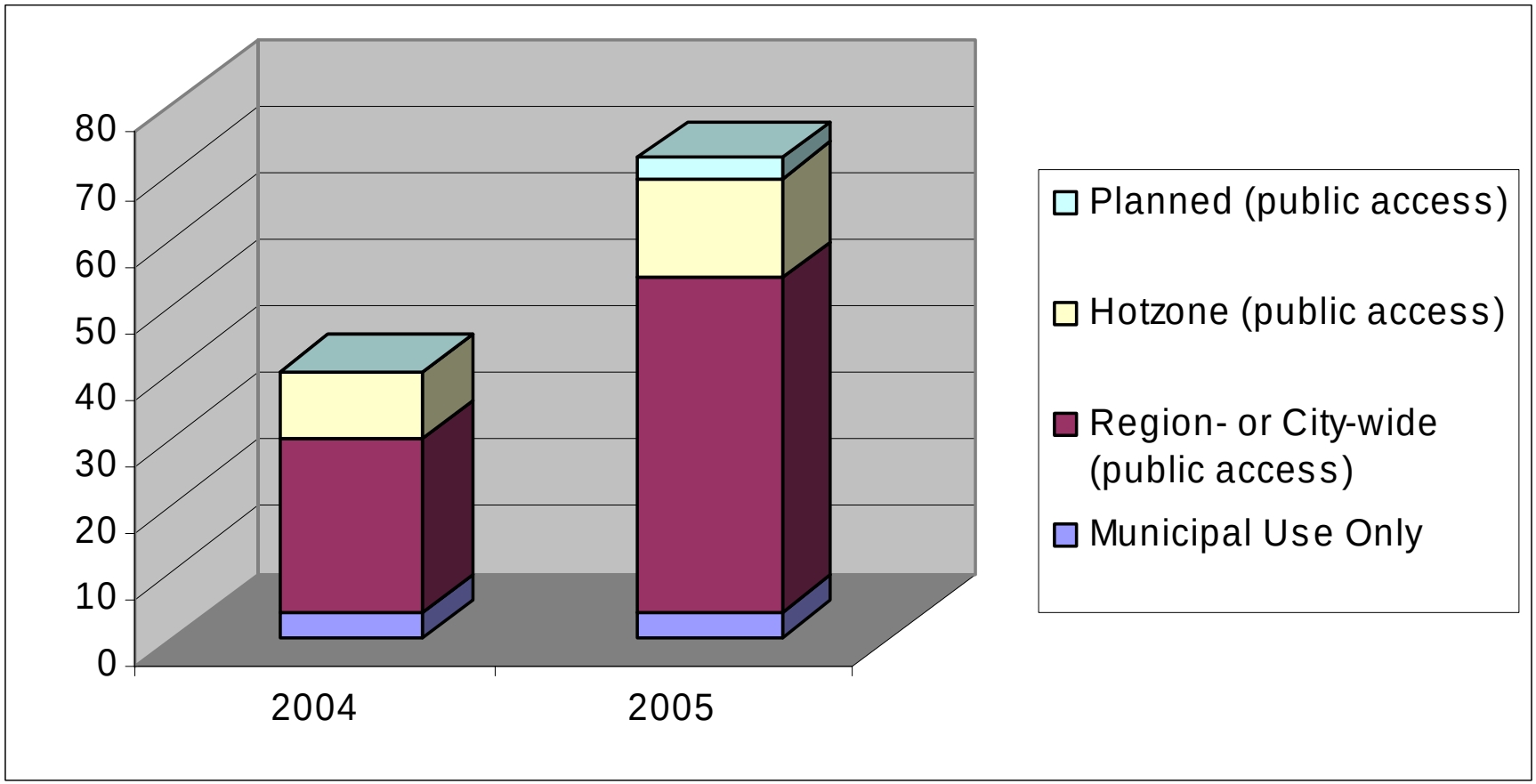
- **Number of local governments sponsoring wireless / broadband networks is small, but growing rapidly**
  - Importance of unlicensed spectrum, standardized commercial technologies (esp. WiFi)
- **Uses are both internal to cities/counties (esp. public safety, schools) and external to the public (businesses, homes, hotspots)**
  - Wireless blurs boundaries → economies of scope
- **Experimentation is healthy for all concerned – public policies need to allow it to happen**
  - Munis have been early adopters of disruptive technologies (e.g. mesh wireless, fiber-to-the-home), driving innovation in communications equipment and applications
- **Real public policy issue is exclusivity, not competition per se**
  - Wireless access network need not be scarce resource
  - But, physical facilities may be (e.g. rooftops, light poles for antenna sites)
- **Proposal: Apply Right-of-Way rules to wireless-enabling facilities**

# U.S. Muni Electric Utilities Doing Communications



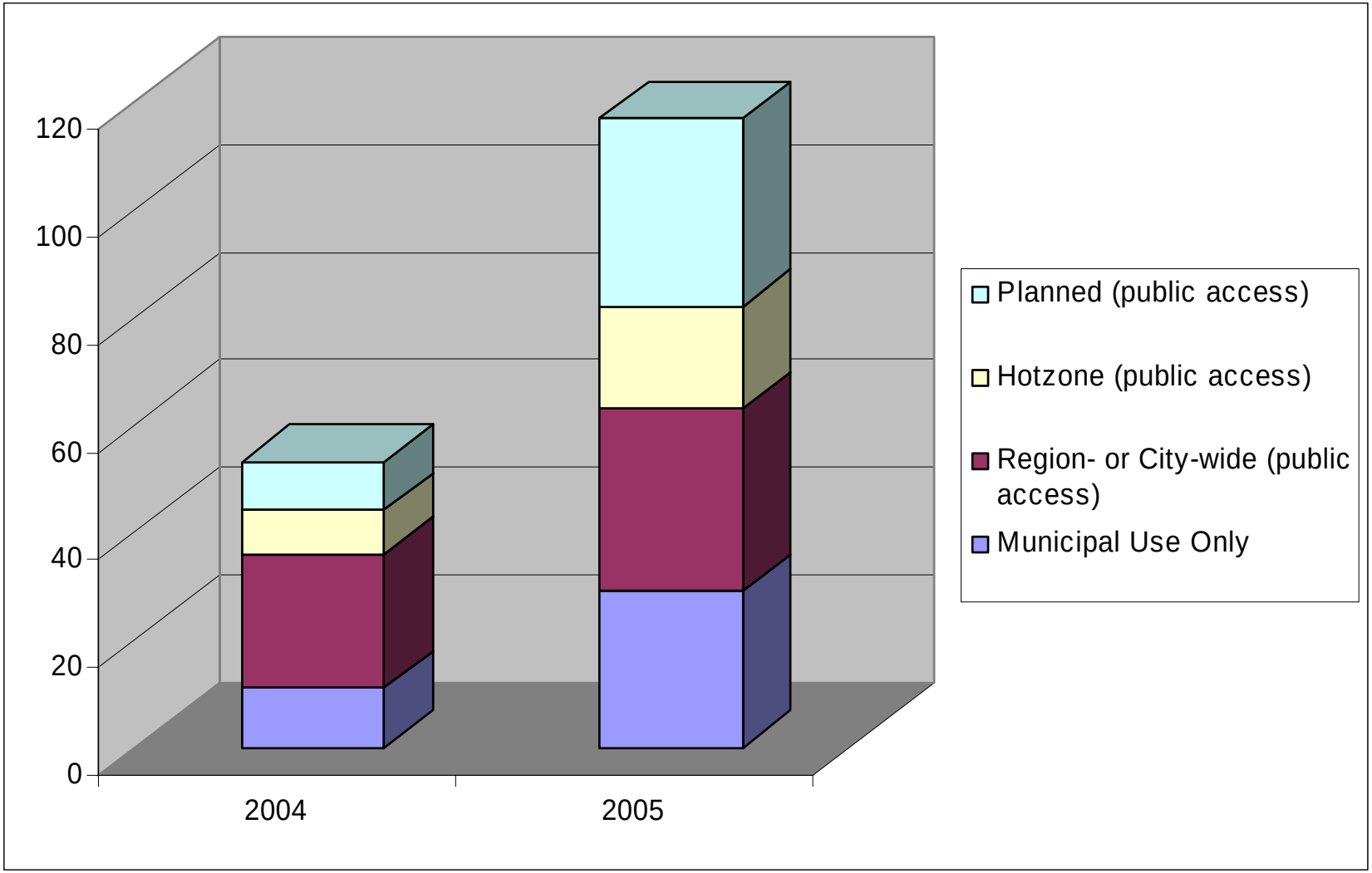

Of about 2,000 MEUs in U.S.
Source: American Public Power Association

# Non-U.S. Muni Wireless Deployments




Source: MuniWireless.com Anniversary Reports (Esme Vos)

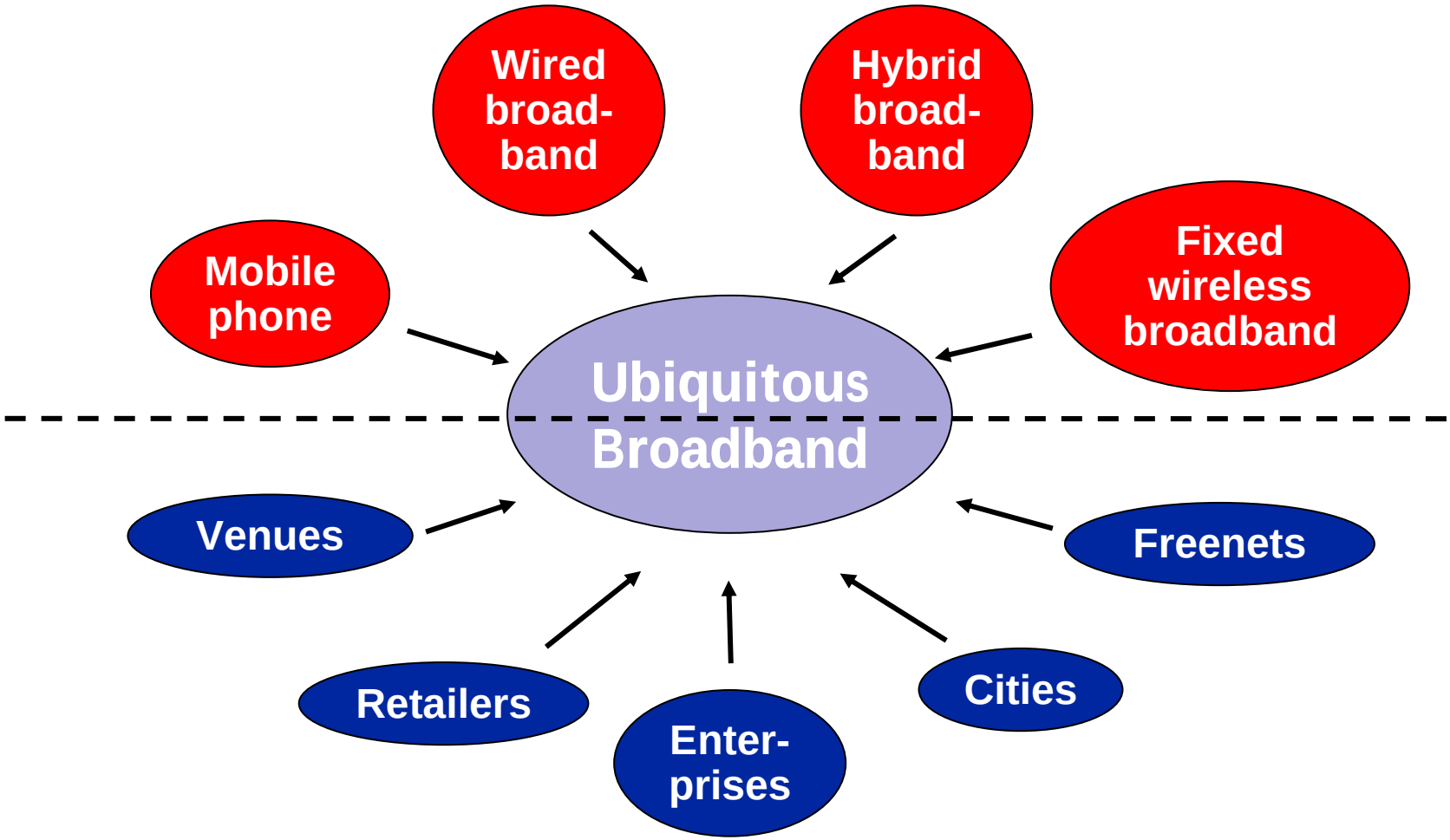
# U.S. Muni Wireless Deployments




Source: MuniWireless.com Anniversary Reports (Esme Vos)

# Why Happening?
# The Unlicensed Wireless Wildcard

***Complements Traditional Carrier Models***




***Enables Unconventional Infrastructure Models***

# City's Own Use: Customer-Owned Network in San Mateo, CA

- **Public Safety Network**
  - Wi-Fi mesh network, on city-owned light poles
  - All HQ broadband applications now mobile
    - Mug shots, fingerprints , Amber alerts, GIS data, HazMat data
  - New applications easily enabled
    - Real-time video surveillance, VoIP
    - Mobile, tactical broadband networks
- **Low cost**
  - $50k grant funding
  - Lower cost than the 19.2Kbps data radio system it replaced
  - "Edge" investments replace recurring costs
  - Same user equipment works in car and at HQ

**Significant Productivity and Efficiency Improvement**


Sources: Ron Sege, Tropos; Muniwireless.com

# Public-Private Partnership: Cerritos, CA Dual-Use WiFi Mesh Network

- ***Fast and simple***
  - Commodity 802.11b clients
  - Less than 1 month to install
- ***True metro-scale***
  - 9 sq. miles
  - 17,000 homes passed
  - 50,000 residents
- ***Low cost to own and to operate:***
  - <$600k *total* CAPEX
  - *One* wired backhaul link for the network
    - POP to Internet
  - No special CPE; no truck rolls
  - $15 opex/sub @15% penetration
- **Bands used: 2.4 GHz**

aiirmesh communications

USA TODAY Money

**City takes fast track to high-speed access**

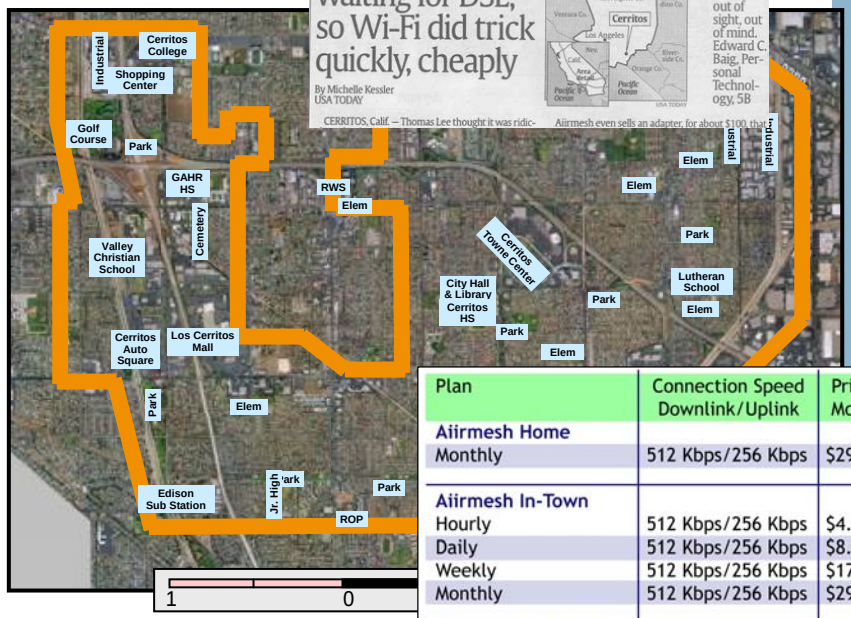
Town got tired of waiting for DSL, so Wi-Fi did trick quickly, cheaply

By Michelle Kessler
USA TODAY

CERRITOS, Calif. — Thomas Lee thought it was ridic-

Aiirmesh even sells an adapter, for about $100, tha-

▸ New TV ensures cords are out of sight, out of mind. Edward C. Baig, Per-sonal Technol-ogy, 5B




| Plan | Connection Speed Downlink/Uplink | Price/ Month |
|---|---|---|
| **Aiirmesh Home** | | |
| Monthly | 512 Kbps/256 Kbps | $29.99* |
| **Aiirmesh In-Town** | | |
| Hourly | 512 Kbps/256 Kbps | $4.99 |
| Daily | 512 Kbps/256 Kbps | $8.99 |
| Weekly | 512 Kbps/256 Kbps | $17.99 |
| Monthly | 512 Kbps/256 Kbps | $29.99* |
| **Aiirmesh BusinessPro** | | |
| Monthly | 1 Mbps/1 Mbps | $249.99* |

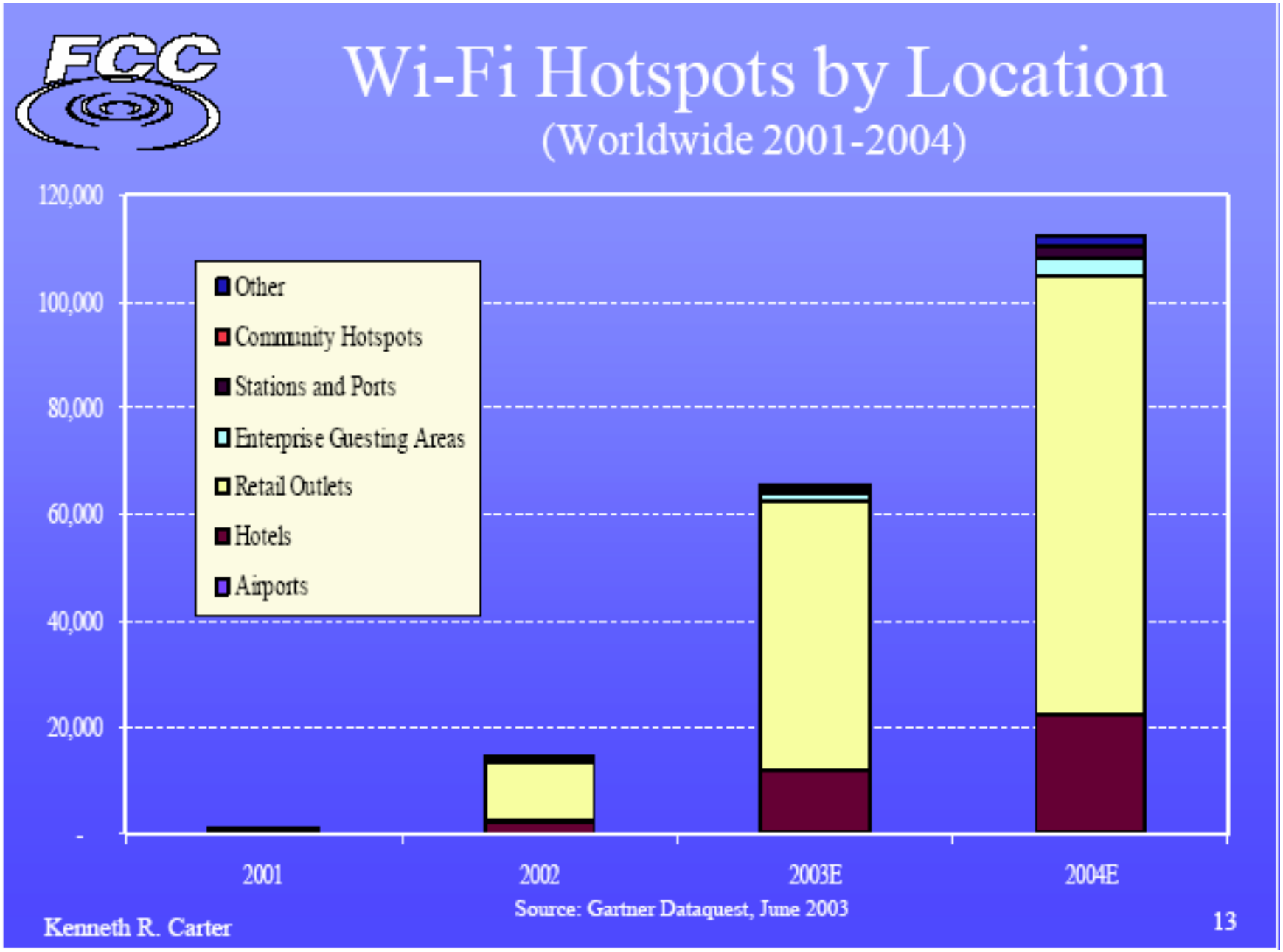
*Annual contract agreement required.

Source: Ron Sege, Tropos

# Serving the Public: Does Broadband Matter?

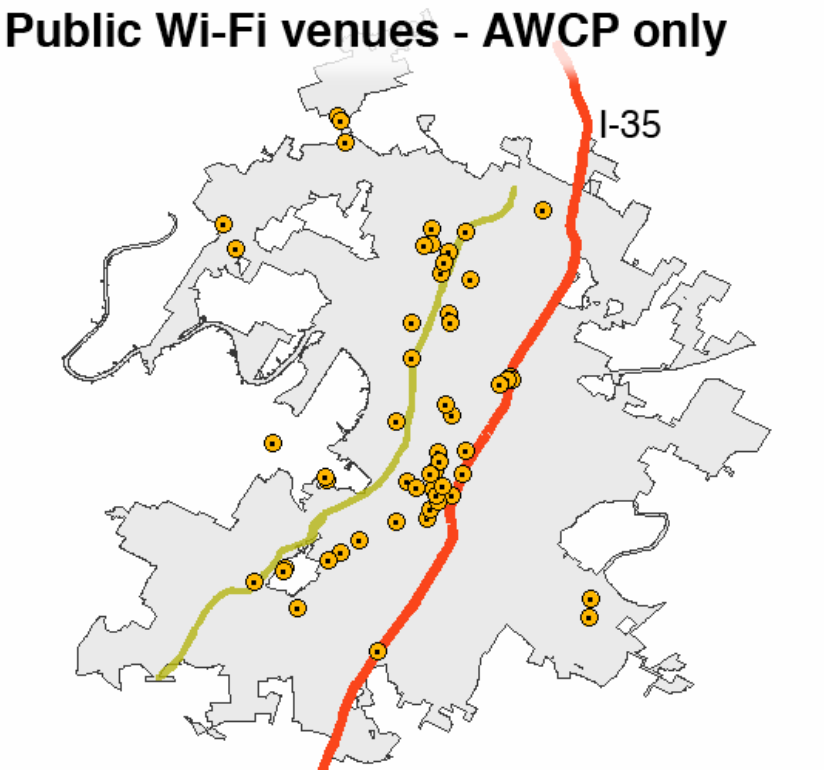
- **MIT/CMU study of broadband's economic impact**
  - Funded by Department of Commerce and matching funds from MIT CFP industry sponsors
  - Conducted by William Lehr, Marvin Sirbu, Carlos Osorio and Sharon Gillett
  - National-scale statistical study, comparing 2002 economic indicators by zip code, distinguishing communities by their BB availability in 1999 (as reported by FCC)
- **Data consistent with conclusion that broadband positively affects economic activity**
  - Even after controlling for community-level factors known to influence BB availability and economic outcomes
  - Controls: urban, income, education, growth in previous period
  - Usual academic caveats: data early and limited; potential methodological refinements

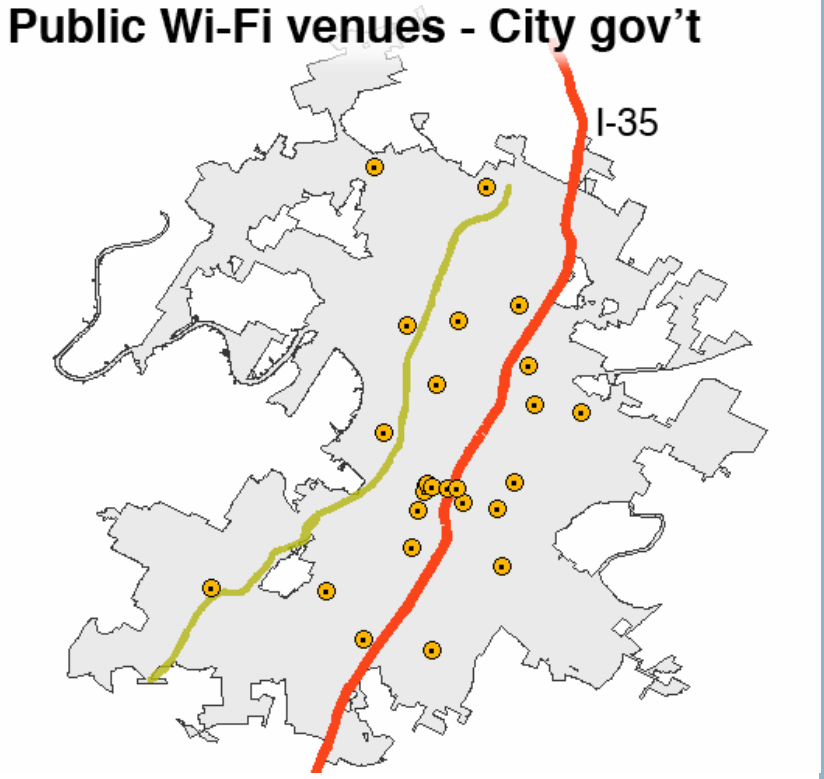
| Economic Indicator | Results |
|---|---|
| Employ-ment (Jobs) | BB added about 1% to growth rate 1998-2002 |
| Property Values | Housing rents more than 6% higher in 2000 where BB available by 1999 |
| Number of Firms | BB added nearly 0.5% to growth rate in number of business establishments, 1998-2002 |
| Industry Mix | BB added over 0.5% to share of establishments in IT-intensive sectors, 1998-2002 |




Source: Kenneth Carter, FCC, April 16, 2004 presentation

# City's Role in Narrowing Digital Divide: Public-Private Hotzones in Austin, Texas




AWCP=Austin Wireless City Project

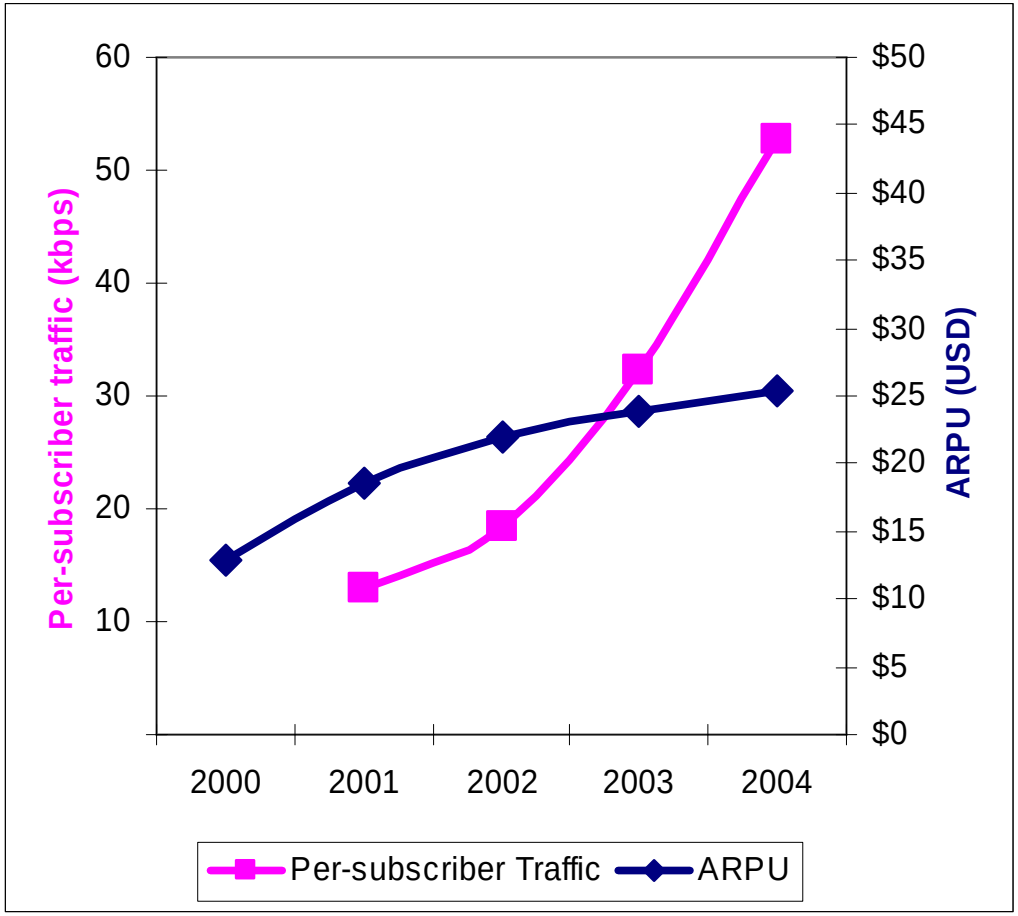
Source: Martha Fuentes-Bautista and Nobuya Inagaki, "Wi-Fi's Promise and Broadband Divides: Reconfiguring Public Internet Access in Austin, Texas," Telecommunications Policy Research Conference, September 2005, www.tprc.org

# The Plot Thickens: Major Cities Plan WiFi Initiatives


- **Common themes**
  - What is the (most important) problem to be addressed?
    - Muni IT vs. digital divide vs. ubiquitous coverage vs. seamless user experience
  - With what funds?
    - Targeted vs. distributed, public vs. private
  - Political and highly visible decision environment
- **Philadelphia**
  - Fall 2004: Big announcement, vague plans for city-run network, $10M
  - Spring 2005: Open access business plan (network open to multiple ISPs)
  - Fall 2005: 12 bidders, select Earthlink to finance, build, manage network, and share revenue with City's "Wireless Philadelphia" initiative ($20/mo, $10 for low-income)
- **San Francisco**
  - Fall 2005: Two dozen responses to City's RFI
  - Should city build open access fiber backbone, Internet exchange point, or wireless access?
  - Google proposal: ad-supported 300 Kbps for all?

# Will Broadband be “Free”? (TANSTAAFL)

- **Normative: *Should* be free, as a matter of equity**
  - Externality benefit from those who wouldn’t otherwise be on net
  - Analogous to public libraries
    - Info access key to democracy
    - Compete with bookstores, but limited
  - Expect some users will pay for more: support, bandwidth, etc.
- **Positive: Cost structure makes “free” more efficient**
  - Low capital costs of wireless
  - Effectiveness of targeted (Google) ads as revenue source
  - But: Operational costs?
    - Billing (no)
    - Support
    - Bandwidth (middle-mile)

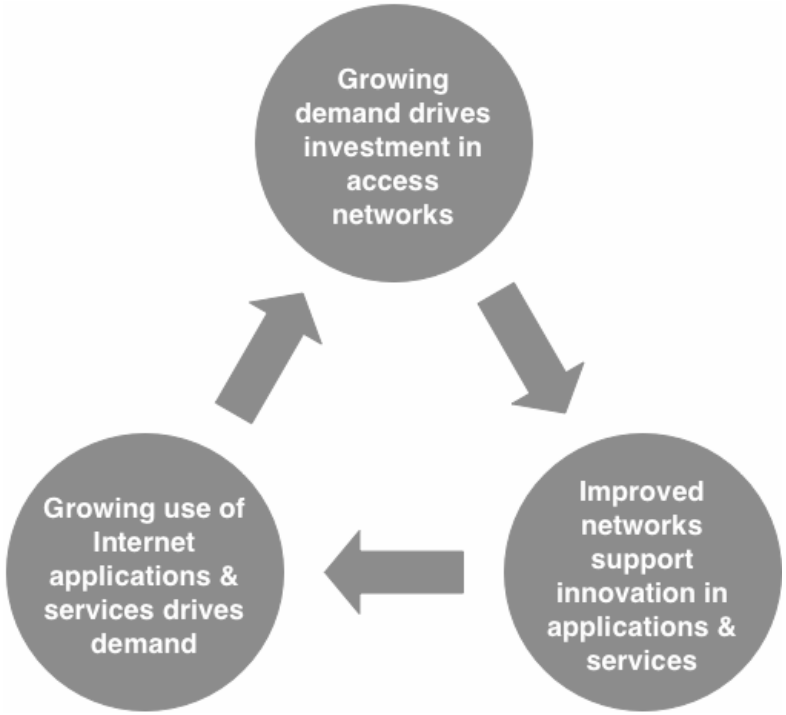



**Korea Telecom Traffic vs. Revenue Growth**

Sources: Korean Times, KT Seeks Usage-Based Internet Pricing, 3/29/05; KT Corporation 2004 Annual Report.

# MIT CFP Broadband Working Group

- **Charter: "Virtuous Cycle" as broadband ideal**
  - Promote investments so BB follows Moore's Law
  - Economics, business models, pricing, policy etc. in addition to technology
- **John Watlington, France Telecom, Industry Co-Chair**
- **Meeting since November 2004**
  - Members email list
  - Conference calls ~2x/month
  - In-person workshops ~2x/year
  - http://cfp.mit.edu/groups/broadband/broadband.html




- **Focus topics**
  - **Broadband Incentive Problem**: White paper released Sept. 2005
  - **Personal Broadband:** Shift from place to person
  - Broadband Policy Scenarios

# Public Policy and Municipal Broadband

- **State restrictions on municipal broadband upheld by Supreme Court**
  - 13 states had enacted limits on municipal communications
    - Varying restrictions on services, business model, approval process, imputed costs, cross-subsidy etc.
  - *Nixon vs. Missouri Municipal League,* March 2004
    - Telecom Act of 1996 does not pre-empt state restrictions on municipal entry, despite "any entity" language of section 253(a)
  - 5 new additions since: Pennsylvania, Colorado, Florida, Louisiana, Tennessee
- **Federal proposals: Congressional ping-pong, 2005**
  - May, H.R. 2726 (Sessions): ban municipal communications if private offers in same area
  - June, S. 1294 (Lautenberg-McCain): ban state bans; anti-discrimination clause
  - July, S. 1504 (Ensign): broadly deregulatory (Titles I, II, VI); munis defer to private
  - Sept, H.R. xxxx (Barton-Dingell): network neutrality; ban state and federal bans on public BITS, VoIP, video (sec. 409)

Sources: American Public Power Association (www.appanet.org); Baller Herbst Law Group (www.baller.com)

# Implications for Public Policy

- **Don’t ban municipal broadband!**
  - Experimentation is necessary part of industry evolution, and good for all concerned
- **“Unfair” competition?  A red herring issue.**
  - In many locales there will be many overlapping wireless networks → “Personal” BB
  - If people willing to pay, then private sector will find ways to profit (like bookstores).
  - If people not willing to pay, then private sector will be glad to have cities subsidize a money-losing but economy-enabling utility (like roads and public transportation).
- **Real issue: Exclusive access to city facilities**
  - Many city-owned fixtures facilitate wireless access
    - Water towers, building rooftops (e.g. schools), street lights, traffic signals, etc.
  - These are the key rights-of-way for wireless networks
  - Need to ensure fair, non-exclusive access for multiple wireless networks
- **Proposal: Apply Right-of-Way rules to wireless-enabling facilities**
  - Extend definition of right-of-way for wireless

# Publications on Municipal Broadband: MIT Communications Futures Program

William H. Lehr, Marvin A. Sirbu, and Sharon E. Gillett, "Wireless is Changing the Policy Calculus for Municipal Broadband" Government Information Quarterly, forthcoming.

Marvin A. Sirbu, William H. Lehr, and Sharon E. Gillett, "Evolving Wireless Access Technologies for Municipal Broadband" Government Information Quarterly, forthcoming.

Sharon E. Gillett, William H. Lehr, and Carlos Osorio, "Municipal Electric Utilities' Role in Telecommunications Services," Telecommunications Policy, forthcoming.

Sharon E. Gillett, William H. Lehr & Carlos A. Osorio. "Municipal Trends," Broadband Properties Magazine, September 2004. Excerpted from "The Municipal Role in U.S. FTTH Market Growth," FTTH Council's 3rd Annual FTTH Conference & Expo, October 3-6, 2004, Orlando, FL.

Marvin Sirbu, William Lehr, and Sharon E. Gillett. "Broadband Open Access: Lessons from Municipal Network Case Studies," 32nd Annual Telecommunications Policy Research Conference, October 1-3, 2004, Arlington, VA. Also see Case Study Appendix.

Sharon E. Gillett, William H. Lehr, and Carlos Osorio, "Local Government Broadband Initiatives," Telecommunications Policy 28, August/September 2004, pp. 537-558.

Carlos A. Osorio, "Bits of Power: The Involvement of Municipal Electric Utilities in Broadband Services," MIT MS Thesis, June 2004.

# Additional Information

# Communications Futures (CFP) in a Nutshell

## CFP VISION

- Define the roadmap for the communications industry and its impact on adjacent industries
- Develop cross-cutting partnerships between industry and university
- Focus on destabilizing shifts of intelligence and control between network owners and end users

## WORKING GROUPS

- Broadband, jointly with CIPS
- Core-Edge (Business) Dynamics
- Internet Architecture (QoS, D-DOS, Routing)
- Security and Privacy
- Viral Networking

## UNIVERSITY PARTNERS

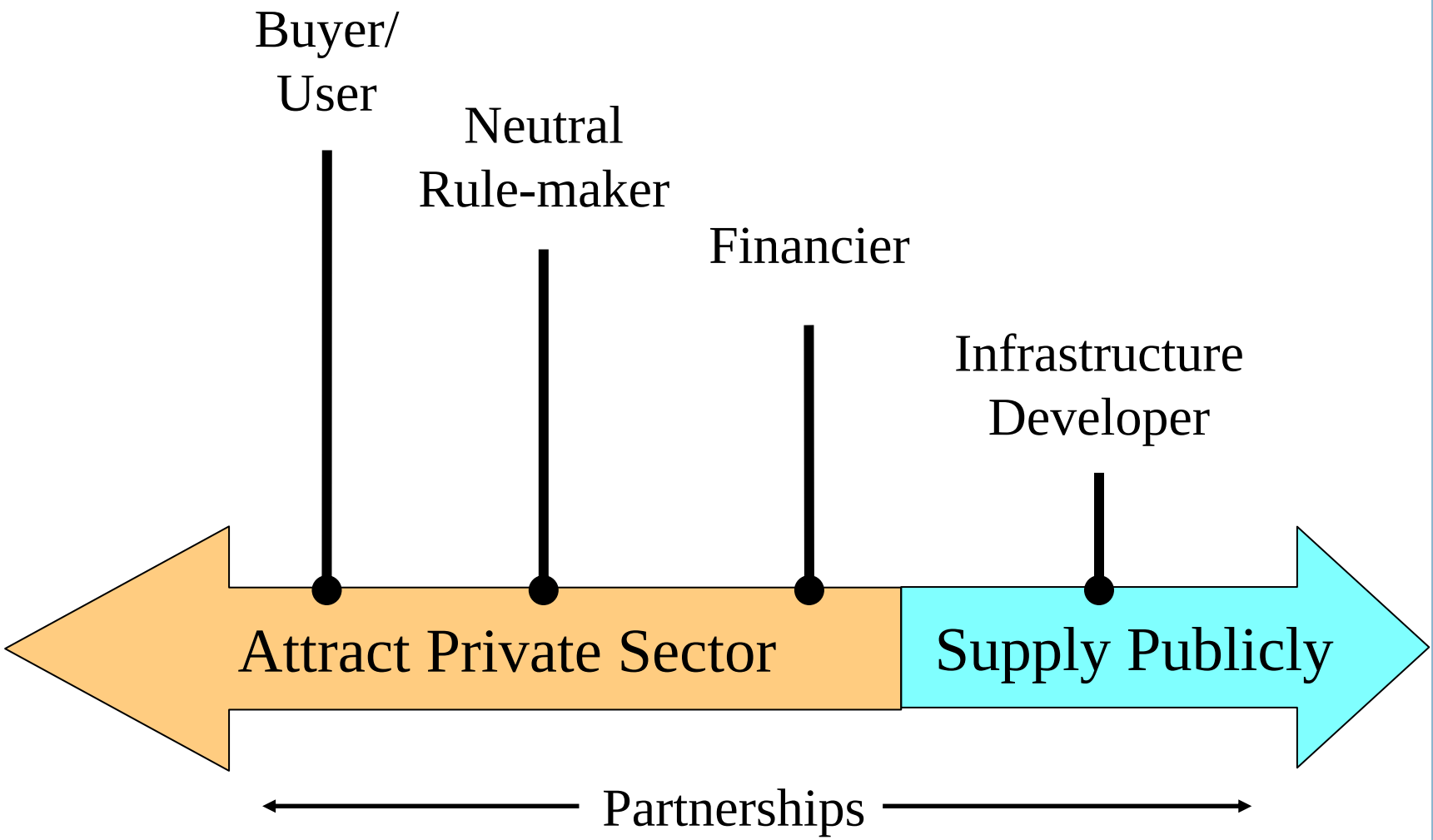
- MIT CSAIL (David Clark)
- MIT CTPID (Sharon Gillett)
- MIT Media Lab (Andy Lippman, David Reed)
- MIT Sloan School of Mgmt (Charlie Fine)
- Cambridge and UCL (Jon Crowcroft, Mark Handley, Ian White, Richard Penty, Alwyn Seeds)

## INDUSTRY PARTNERS

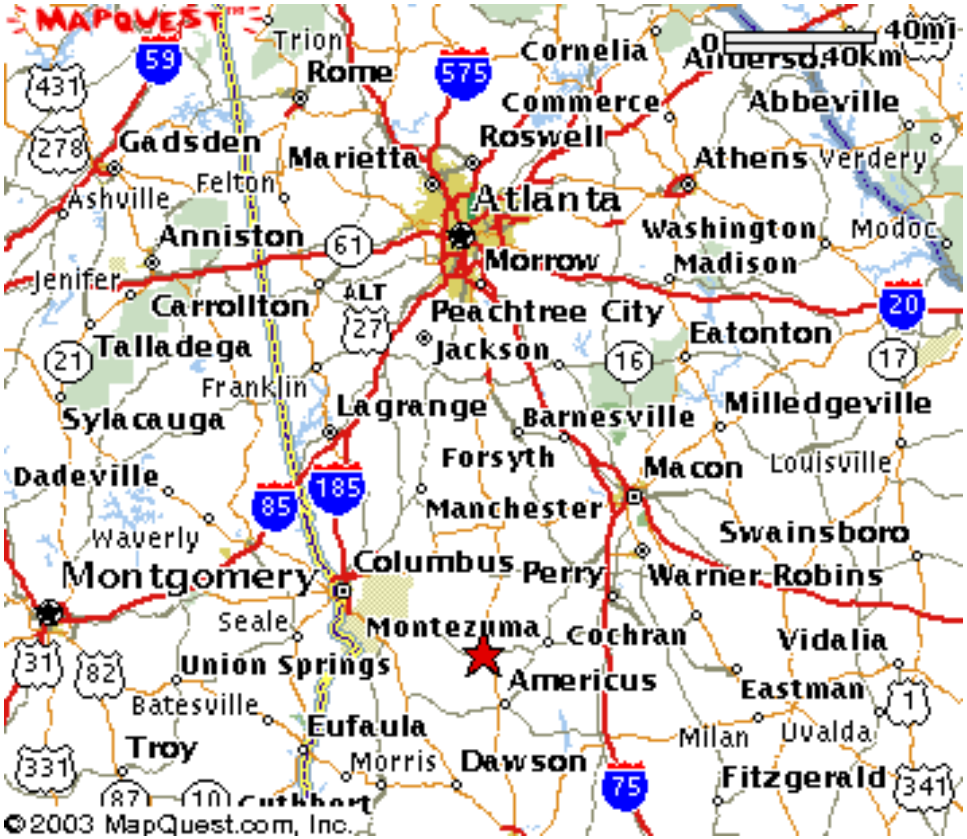
- British Telecom
- Cisco
- Comcast
- Deutsche Telekom
- France Telecom
- Intel
- Motorola
- Nokia
- Nortel
- Samsung
- T-Mobile

*For further information: http://cfp.mit.edu or email Deborah Widener, dw@media.mit.edu*

# Taxonomy: Role of Gov't *vis a vis* Broadband



# MEU Wireless Example: City of Ellaville, Georgia

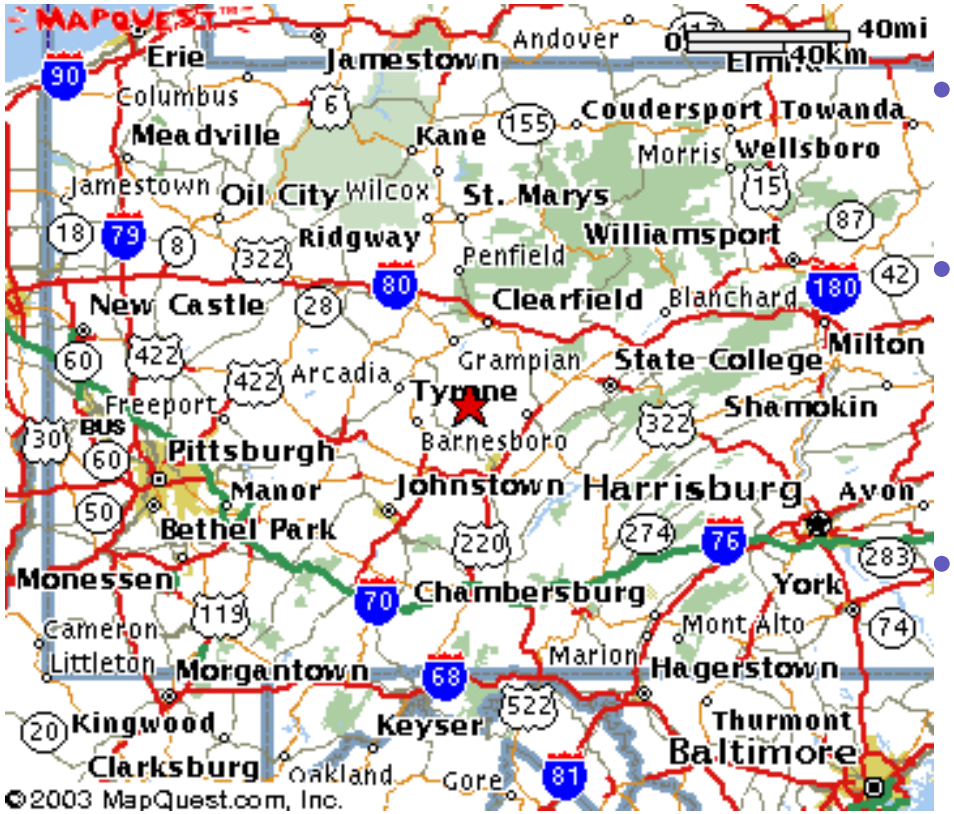



- **Population <2,000**
- **3 antennas on City's main water tank**
  - 2.4 GHz LOS (Alvarion) + 900 MHz N-LOS (WaveRider) – trees!
- **$200,000 upfront cost**
- **Users pay for service (~1 Mbps @ $30-45/mo), modem ($200) + antenna ($100-150)**
- **1.5 Mbps backhaul (ouch)**

**Small Cities Serve Their Own**

http://www.isp-planet.com/fixed_wireless/business/2002/municipal.html

# Glendale School District, Flinton, Pennsylvania




- **$457,000 “digital divide” grant - GAIN**
- **Extend wireless bb Internet access from school to nearby communities, schools**
- **Mobilize community support for “100 laptops” – tech and job skills training**

Municipal

# Allegany County

USA

- 100% of all public buildings and non-profits connected via wireless now
- Becoming the local carrier
- 85% of all residential will be covered
- 95% of all commercial
- Redundant and carrier-class
- Largest municipal wireless deployment in the U.S.
- Deploying BreezeACCESS Complete Spectrum


http://prime.allconet.org/allconet2